Investigation 5

Reasoning With Symbols

You have looked at patterns and made conjectures and predictions. You have given informal arguments to support your conjectures. In this investigation, you will look at how algebra can help you further justify some of your conjectures by providing evidence or proof.

5.1 Using Algebra to Solve a Puzzle

People receive a lot of information by email. Some emails are useful, while others are for fun. A puzzle similar to the following appeared in several emails in 2003.

Problem 5.1 Using Algebra to Solve a Puzzle

On February 1, 2006, Elizabeth shared the following puzzle with her classmates.

- Pick a number from 1 to 9.
- Multiply this number by 2.
- Add 5.
- Multiply by 50.
- If you already had your birthday this year, add 1,756. If not, add 1,755.
- Subtract the four-digit year in which you were born.

A. 1. Suppose the year is 2006. Work through the steps using today's month and day.

2. You should have a three-digit number. Look at the first digit and the last two digits. What information do these numbers represent?

B. Let n represent the number you choose in the first step. Repeat the steps with n. Use mathematical statements to explain why the puzzle works.

C. Will the puzzle work for the current year? If not, how can you change the steps to make it work?

ACE Homework starts on page 76.

5.2 Odd and Even Revisited

In *Prime Time,* you looked at factors and multiples. You explored several conjectures about even and odd whole numbers, including:

- The sum of two even whole numbers is even.
- The sum of an even whole number and odd whole number is odd.

How might you convince a friend that these conjectures are true?

Are these conjectures true for odd and even integers?

Getting Ready for Problem 5.2

Daphne claims that the algebraic expression $2n$, where n is any integer, will produce all even integers.

- Is Daphne correct? Explain.
- Write a symbolic expression that will produce all odd integers. Explain why it works.